REMARKS

The specification has been revised to add cross-reference to the parent application and to correct minor typographical errors in the specification. The claims have been amended to cancel claims 7-19, subject of two separate divisional applications. Claims 1-6 remain in the application and are under consideration.

It is believed that this application is in condition for allowance and such action is respectfully requested. Should the Examiner have any questions, he is requested to contact the undersigned at the telephone number appearing below.

The Commissioner is hereby authorized to charge payment of any extension or additional fees associated with this or any other communication or credit any overpayment to Deposit Account No. 14-1080.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Page 1, cancel the present title and substitute -- Magnet Type Stepping Motor --.

Page 1, after the title insert the following paragraph:

-- CROSS-REFERENCE TO RELATED APPLICATION

This application is a divisional application of Serial No. 09/640,144, filed August 16, 2000, now US. Patent No. 6,281,615 B1, issued August 28, 2001, which is a divisional application of Serial No. 09/437,020, filed November 9, 1999, now U.S. Patent No. 6,121,712, issued September 19, 2000, which is a divisional application of U.S. Serial No. 09/056,190, filed April 6, 1998, now U.S. Patent No. 6,028,377, issued February 22, 2000.--;

Page 2, lines 19-21, replace the paragraph with the following:

-- Such rotor R is called [as] a hybrid type rotor and forms a part of conventional two-phase hybrid type stepping motor 10. --.

Page 4, lines 4-16, replace the paragraph with the following:

-- Accordingly, the one-phase windings are wound around the main poles separated by 180° from each other, so that if the one-phase windings are excited, the two rotor magnetic poles holding the permanent magnet therebetween are magnetized in the opposite polarities. As a result, one of the rotor magnetic poles is pulled in the upward direction, whereas the other of the rotor magnetic poles is pulled in the downward direction, and, accordingly, the rotor shaft is received a [couple of] force couple normal to the axis of the rotor shaft, so that an oscillation and noise are generated. --.

Page 5, lines 6-8, replace the paragraph with the following:

-- In this manner, a two-phase or multiple-phase excitation has to be adopted in [practical] practice. --.

Page 5, lines 13 and 14, replace the paragraph with the following:

-- This [result in the circuit to be complicated and increased in cost] results in an expensive and complicated circuit. --.

Page 6, lines 13-17, replace the paragraph with the following:

-- 2) a rotor of a cylindrical permanent magnet magnetized in the circumferential direction so as to form Z/2 pieces of N pole and Z/2 pieces of S pole [alternately], where Z is the number of rotor poles. --.

Page 6, lines 23-25, replace the paragraph with the following:

-- [Further] A further object of the present invention is to provide a two-phase permanent magnet type stepping motor comprising: --.

Page 11, lines 16-20, replace the paragraph with the following:

-- Still another object of the present invention is to provide a three-phase annular winding cascade [craw-pole type] claw-type stepping motor and a driving method thereof, the stepping motor comprising: --.

Page 12, lines 1-25 and page 13, lines 1-9, replace the paragraphs with the following:

-- a stator having annular three stator elements arranged in the axial direction of the rotor concentrically with the rotor axis, each [of said] stator element consisting of two opposite stator cores having [craw] claw poles extending axially from the inner peripheral surface

thereof, and of three stator windings of U, V and W phases held between [said] the two stator cores, [said] the windings of U, V and W phases being arranged in this order in the axial direction, [said craw] the claw poles being separated by 180° from one another and magnetized by said stator windings in opposite polarities alternately, [said] the three stator windings being connected to form [the] a star or delta connection,

adjacent [craw] claw poles magnetized by the stator windings of U phase and V phase are deviated by 120°/M from each other in the circumferential direction, and adjacent [craw] claw poles magnetized by the stator windings of V phase and W phase are deviated by 120°/M from each other in the circumferential direction, [said] the annular stator windings being excited so that a magnetic flux generated by annular stator windings of one phase in the axial direction becomes always the same to that generated by the other annular stator windings adjacent to [said] the annular stator windings of [said] the one phase, but a magnetic flux generated by the annular stator windings in the axial direction becomes always opposite to that generated by the annular stator windings which is not adjacent to [said] the annular stator windings of [said] the one phase, in case of two phase exciting driving. --.

Page 14, lines 17-20, replace the paragraph with the following:

-- Fig. 9 is a perspective extended view of a three-phase cascade [craw-pole type] claw-type stepping motor according to a sixth embodiment of the present invention; --.

Page 30, lines 10-25 and page 31, lines 1-15, replace the paragraphs with the following:

-- A three-phase cascade [craw-pole type] claw-type stepping motor as shown in Fig. 9 and a three-phase permanent magnet type stepping motor having piled stators as shown in Fig. 12 are economical.

Fig. 9 is an extended view of a stator 70 and a rotor 80 having on the outer peripheral surface thereof M pieces of N pole and M pieces S pole alternately. The stator 70 consists of first, second and third stator units 11, 12 and 13 corresponding to windings 11c, 12c and 13c of U, V and W phases, respectively. The first stator unit 11 has M pieces of [craw] claw pole 11a and M pieces of [craw] claw pole 11b in the form of comb extending axially, [said craw] claw poles 11a and 11b being separated by 180 °/M from one another on the inner peripheral surface of the stator 70, and the winding 11c wound around an inside bobbin 11d. The second stator unit 12 has M pieces of [craw] claw pole 12a and M pieces of [craw] claw pole 12b, and the winding 12c wound around an inside bobbin 12d similar to that of the first stator unit 11. The third stator unit 13 has M pieces of [craw] claw pole 13a and M pieces of [craw] claw pole 13b, and the winding 13c wound around an inside bobbin 13d similar to that of the first stator unit 11. The rotor 80 consists of a rotor shaft 14, a core 15 and a cylindrical permanent magnet 16 magnetized in the circumferential direction so as to form M pieces of N pole and M pieces of S pole alternately. --.

Page 32, lines 2-14, replace the paragraph with the following:

-- In the stepping motor according to the present invention, the [craw] claw pole 11b magnetized by the stator winding of U phase is deviated by 60°/M in the [circumferntial] circumferential direction from the [craw] claw pole 12a magnetized by the stator winding of V

phase, adjacent to the winding of U phase, and the [craw] claw pole 12b magnetized by the stator winding of V phase is deviated by 60°/M in the [circumferntial] circumferential direction from the [craw] claw pole 13a magnetized by the stator winding of W phase, [said craw] the claw pole 11b being adjacent to [said craw] claw pole 12a, and [said craw] claw pole 12b being adjacent to [said craw] claw pole 13a. --.

Page 33, lines 10-25 and page 34, lines 1-5, replace the paragraphs with the following:

-- Figs. 13(A)-13(F) show the relations between the stator and the rotor when the transistors T1-T6 are driven according to the (1) to (6) of the table shown in Fig. 11. The rotor is rotated with the step angle of 60/M. As apparent from Figs. 13(A)-13(F), the magnetic fluxes generated by the windings of two phases are always opposite to each other as shown by arrows in case of the two-phase driving. In the other embodiment of the present invention, the [craw] claw pole 11b magnetized by the stator winding of U phase is deviated by 120°/M in the [circumferntial] circumferential direction from the [craw] claw pole 12a magnetized by the stator winding of V phase, adjacent to the winding of U phase, and the [craw] claw pole 12b magnetized by the stator winding of V phase is deviated by 120° /M in the circumferential direction from the [craw] claw pole 13a magnetized by the stator winding of W phase.

The three stator windings are connected to form a star or delta connection as shown in Fig. 12. --.

IN THE CLAIMS

Please cancel claims 7-19.

IN THE ABSTRACT

Page 50, cancel the title "STEPPING MOTOR AND DRIVING METHOD THEREOF" and substitute --MAGNET TYPE STEPPING MOTOR --.